Job opportunities from beamline division of High Energy Photon Source (HEPS)

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2025/01/21

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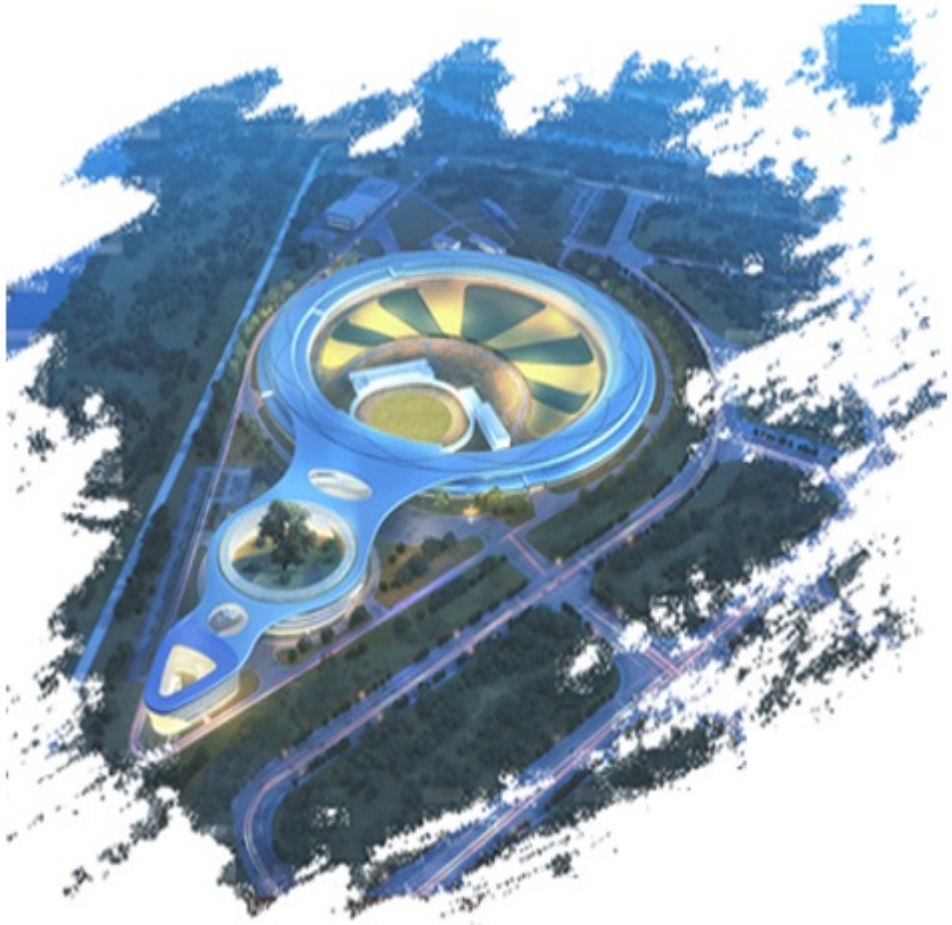


Introduction to High Energy Photon Source (HEPS)

01

HEPS, the first greenfield high energy low emittance light source

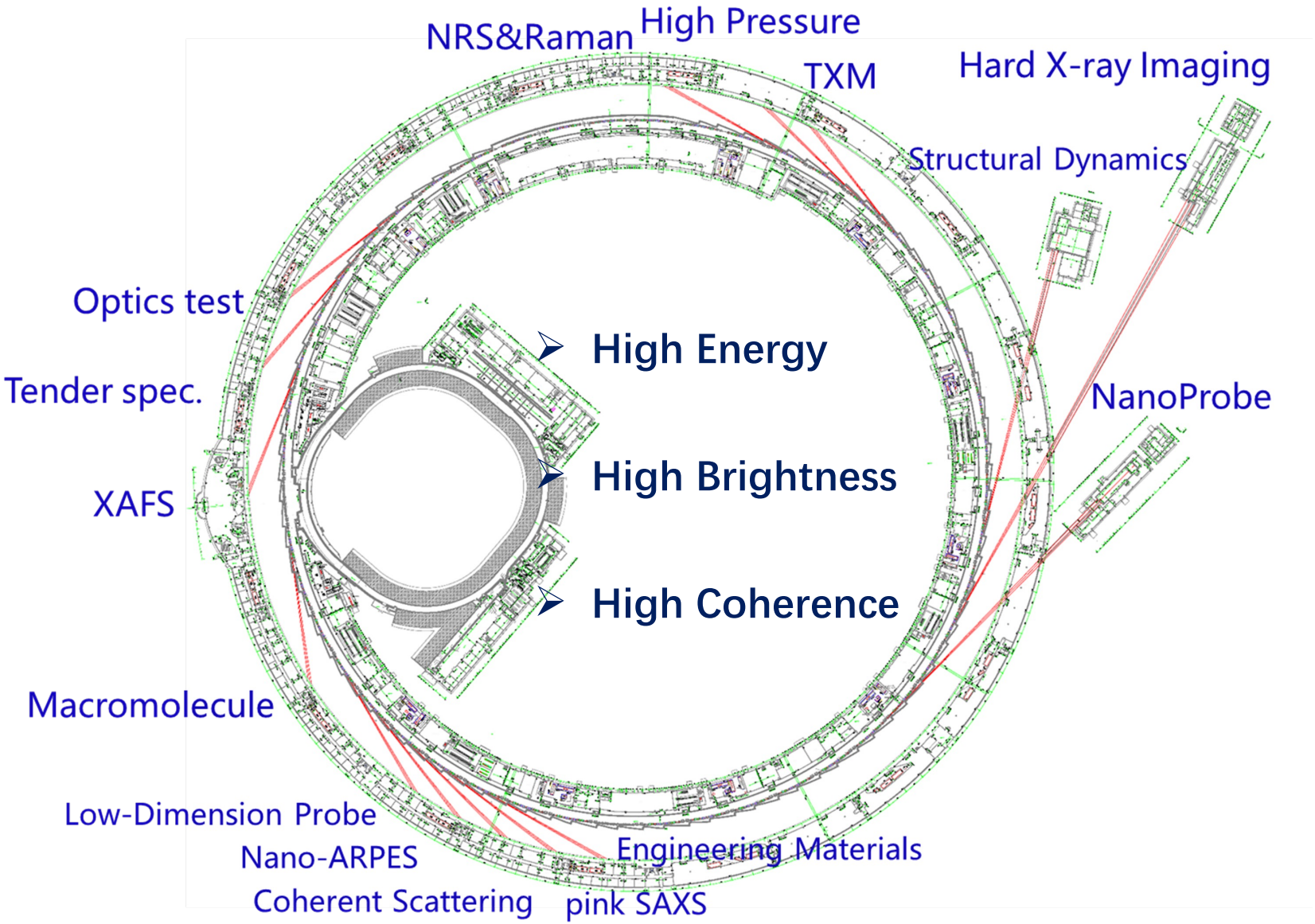
Energy 6GeV, emittance <60pm·rad, ring circumference 1360 m. It could accommodate up to **90 beamlines**

First fourth-generation synchrotron source in China

Phase I, 14 user beamlines and 1 test beamline

The construction period was estimated to be 6.5 years.

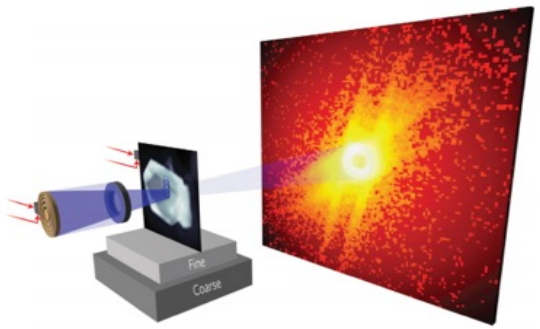
- Date of Groundbreaking ceremony: **Jun. 29, 2019**
- User operation: **Dec. 31, 2025**

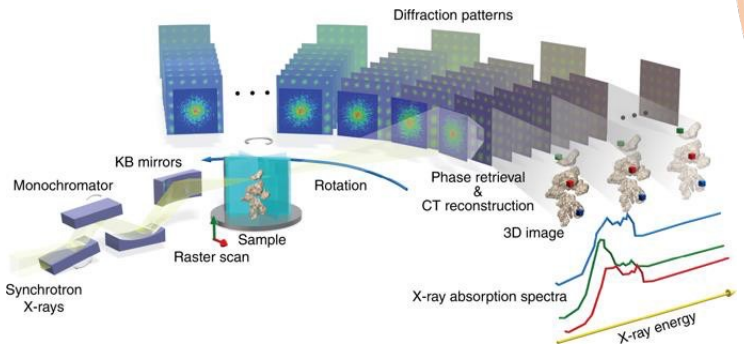


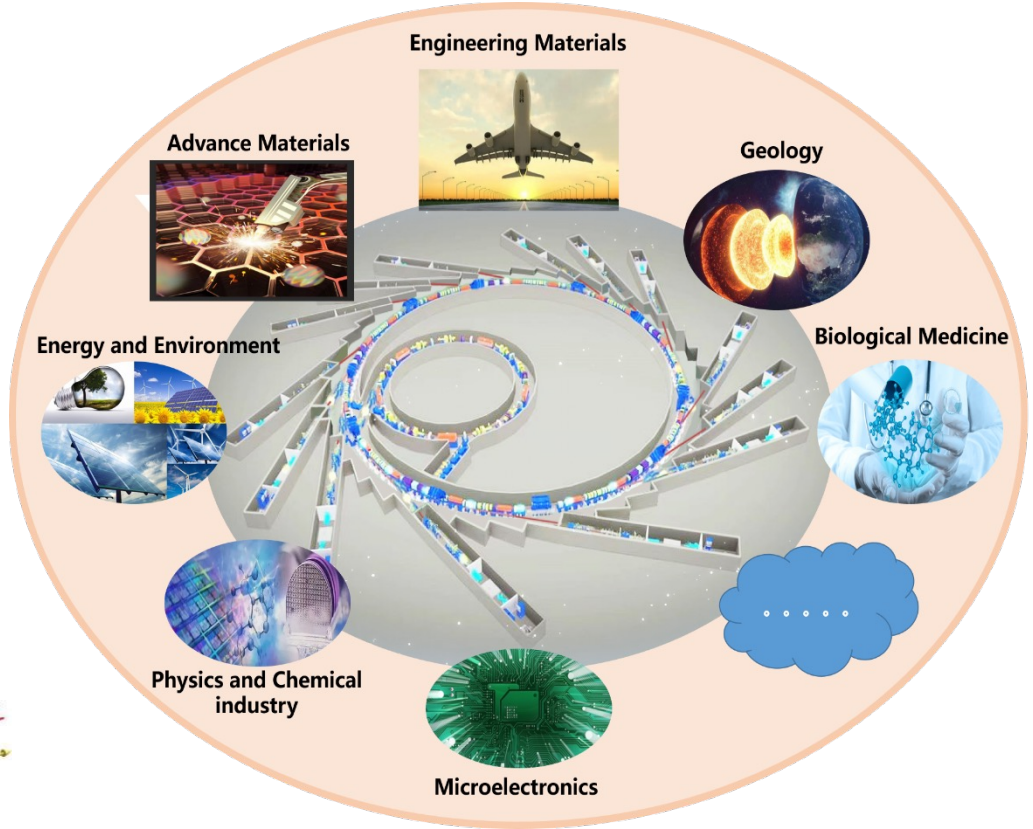
HEPS: a powerful light source

HEPS will provide **high-energy, high-brilliance, high-coherence** synchrotron **light with energies up to 300 keV and more**, with the capability for **nm spatial resolution**, **ps time resolution**, and **meV energy resolution**.

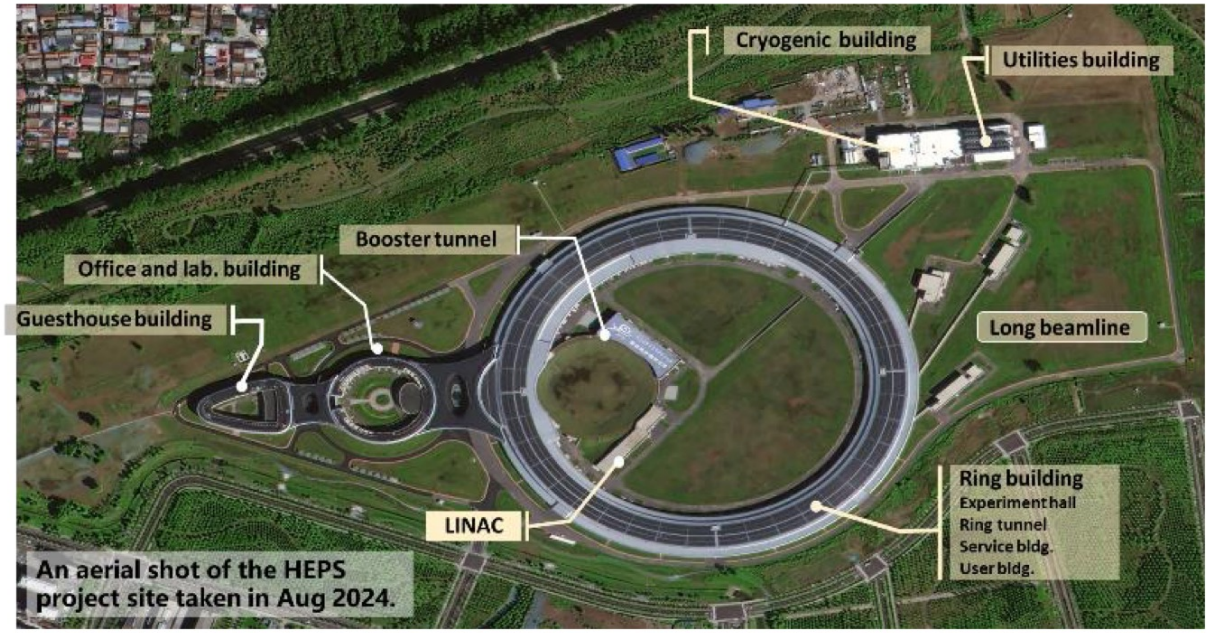
While providing conventional technical support for the general users, HEPS will operate as a platform to analyze the structures, as well as the evolution of structures of engineering materials in the whole process, by in-situ, multi-dimensional and real-time observation.







The progress of HEPS project



Civil Construction and Utility: Completed

LINAC: in operation

Booster: in operation

Storage Ring: under commissioning (SRF cavities and IDs to be installed)

Beamlines: SR beam commissioning (Group 1) and installation (Group 2)

Progress released in Media:
Nature News, May 2024
Science, Nov 2024

nature

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NEWS | 13 May 2024

World's brightest X-rays: China first in Asia to build next-generation synchrotron

The US$665-million High Energy Photon Source (HEPS) outside Beijing puts China among only a handful of countries that have fourth-generation synchrotron light sources.

By Gemma Conroy

Science

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China poised to turn on one of world's most powerful sources of x-ray light

Beams from $657 million next-generation synchrotron will reveal atomic-scale structure of proteins and materials

22 NOV 2024 · 5:30 PM ET · BY RICHARD STONE

China's High Energy Photon Source is days away from funneling bright x-rays into experimental beamlines. INSTITUTE OF HIGH ENERGY PHYSICS/CHINESE ACADEMY OF SCIENCES

The progress of HEPS project --- Civil Construction

650,000m^2 **site area** **150,000m^2** **building area**

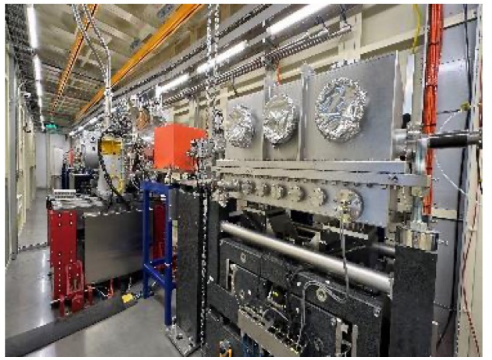
Guest House building, Laboratory Building, Facility buildings

- In 2020, the foundation and the steel structure construction proceeded.
- April 2021, Utility building completed.
- Jun., 2021 The construction of HEPS Linac tunnel completed.
- Dec., 2021, Booster tunnel building completed.
- Dec. 2022, SR and Experimental Hall building completed.
- Dec. 2023, Outdoor project construction proceeded.
- Jan. 2024, Guest house and Lab buildings completed.
- Nov. 2024, Civil construction completed.

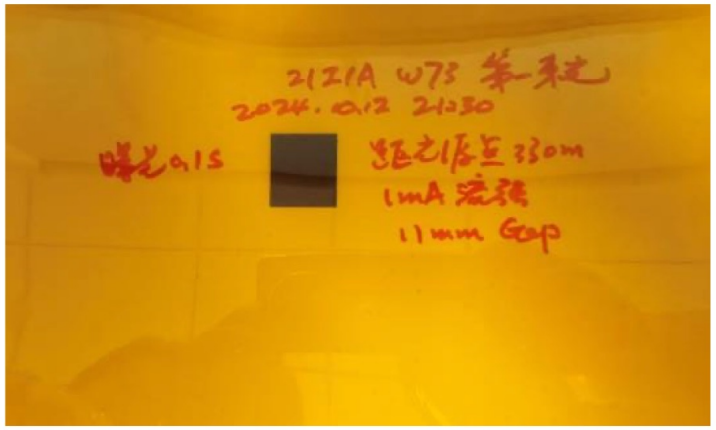
The progress of HEPS project --- Beamline Assembly and Installation

- **Group 1 beamline, BM/IAU/IAW**
  - IDs installed in storage ring
  - Installation and commissioning completed / ongoing
  - Control and data acquisition software ready
  - Photon beam Commissioning began in Oct. 2024
- **Group 2 beamline, IVU/CPMU/Apple Knot/MANGO**
  - Installation finished in the end of 2024
  - Photon beam Commissioning in Apr. 2025
- **All front-ends, FOEs, Hutches are ready.**

Group 1	Hard X-Ray Imaging	IAW/Mango/IVU(G2)
	TXM	IAU
	XAFS	IAU
	Tender spectroscopy	BM
	Pink SAXS	IAU
	μ-Macromolecule	IAU
	Optics Test	IAW/CPMU(G2)
Group 2	Engineering Materials	CPMU
	Nano-probe	CPMU
	Structural Dynamics	CPMU
	High Pressure	IVU
	Nano-ARPES	Apple knot
	Hard X-ray Coherent Scattering	IVU
	Low-Dimension Probe	IVU
	NRS&Raman	IVU

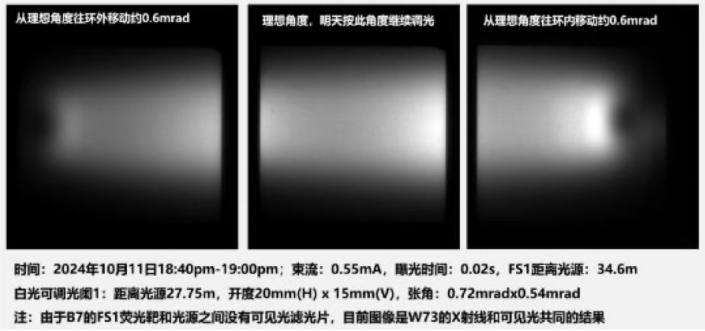


The progress of HEPS project --- Photon Beam Commissioning



Hard X-ray imaging beamline is the longest beamline in the HEPS Phase I, with the distance from the sample to light source being approximately 330m.

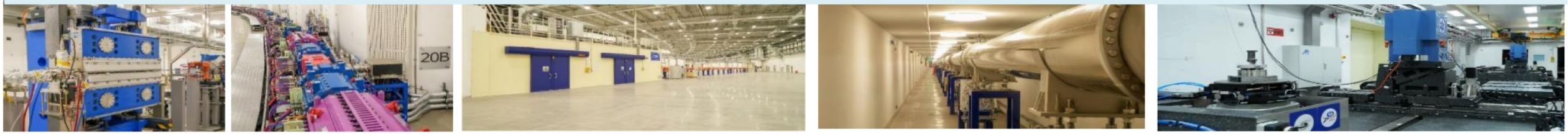
- high-quality X-rays with high energy up to 300keV
- SRX in-line phase contrast imaging and diffraction contrast imaging methods
- engineering materials and components, biomedical science, geology and archaeology



On October 12, 2024, the SR X-ray emitted from the R21 wiggler was successfully transmitted to the end station of the hard X-ray imaging beamline, 330 meters away form the light source.

Imaging Experiments on sample of high-temperature alloys conducted.

Wiggler Source | **Front end** | **Optical hutch** | **BL tunnel** | **end station**



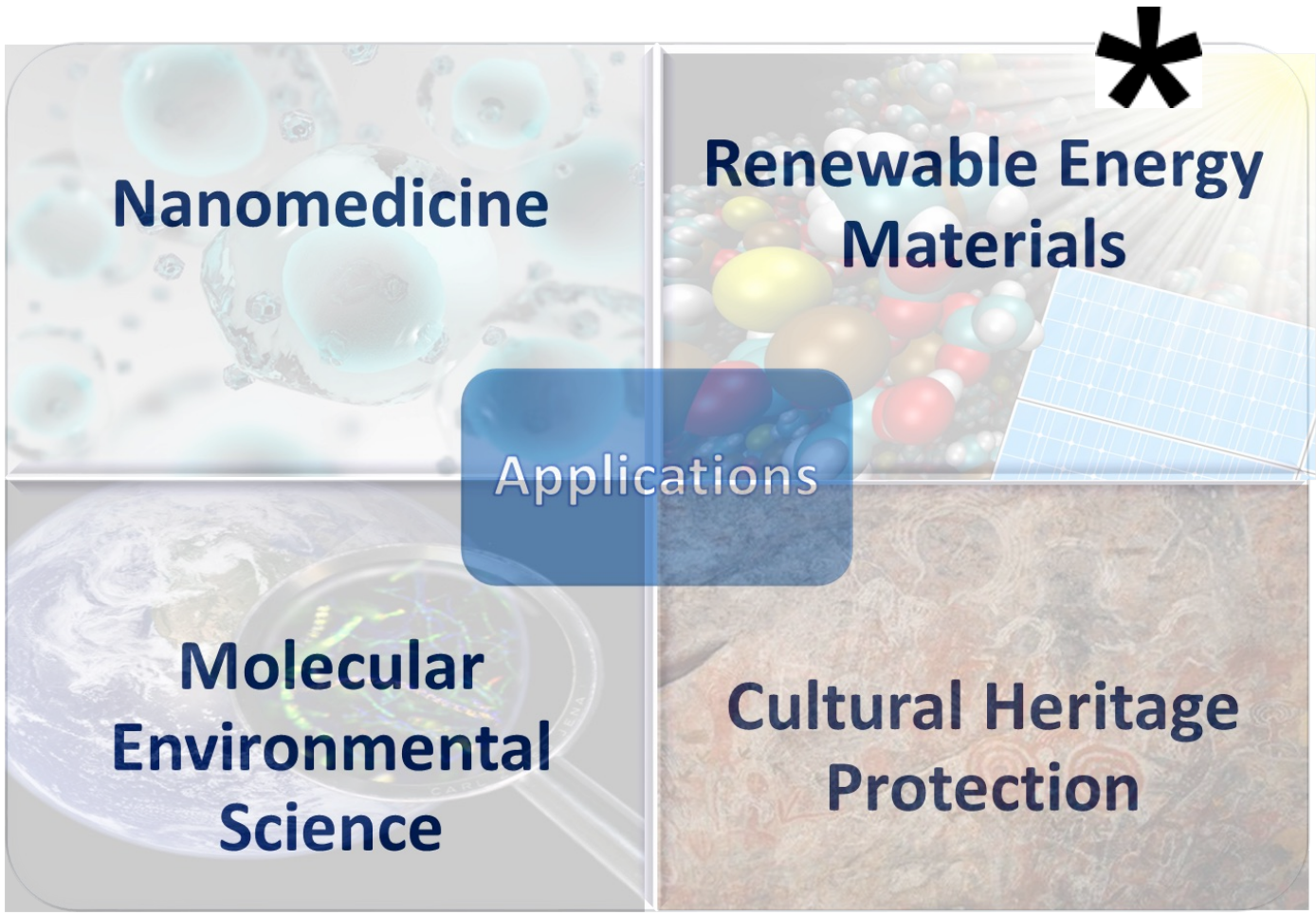
Open Positions

Join us to design，build and commission Phase I and future beamlines

applicants worldwide are welcome (including foreign nationality)

Beamline Instrumentation and Methodology

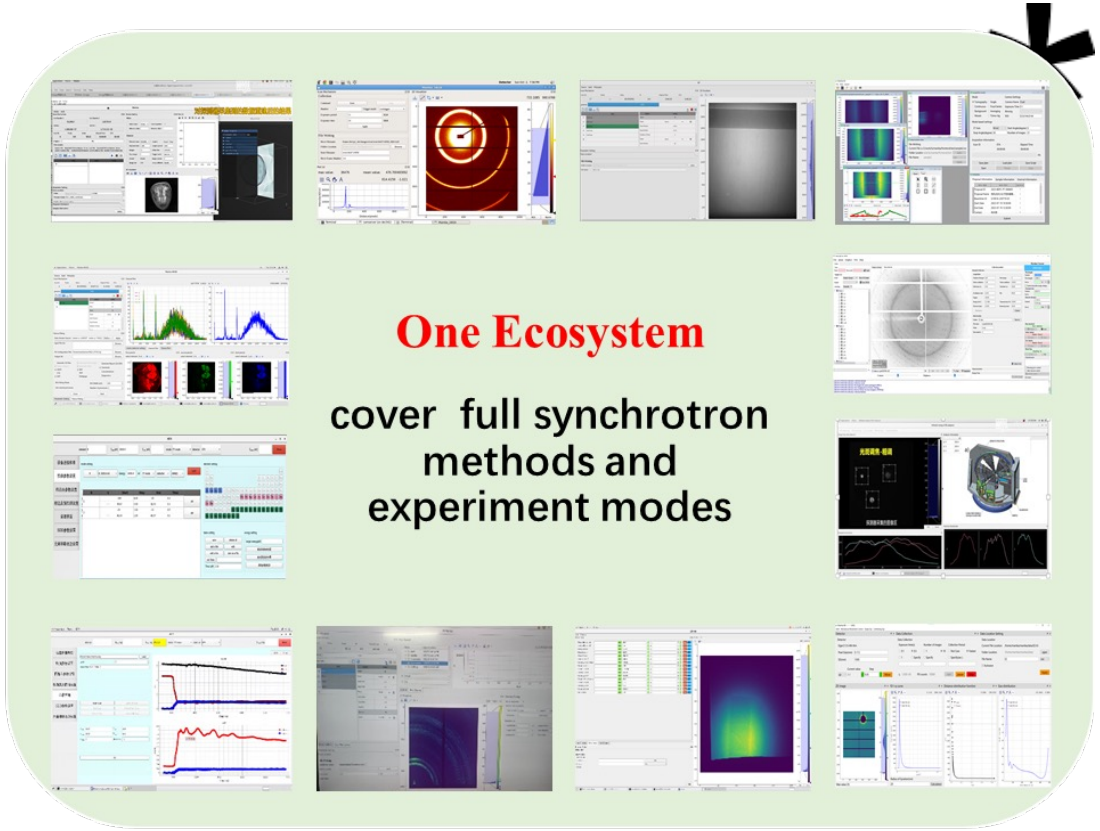
- Frontier **methodology development** in coherent imaging and scattering, inelastic scattering, high energy X-ray scattering and diffraction and imaging, nano-imaging and spectroscopy
- Cutting-edge scientific **beamline instrumentation** development
- State-of-the-art **application research**, especially exploiting features of coherence, brightness and high energy X-rays

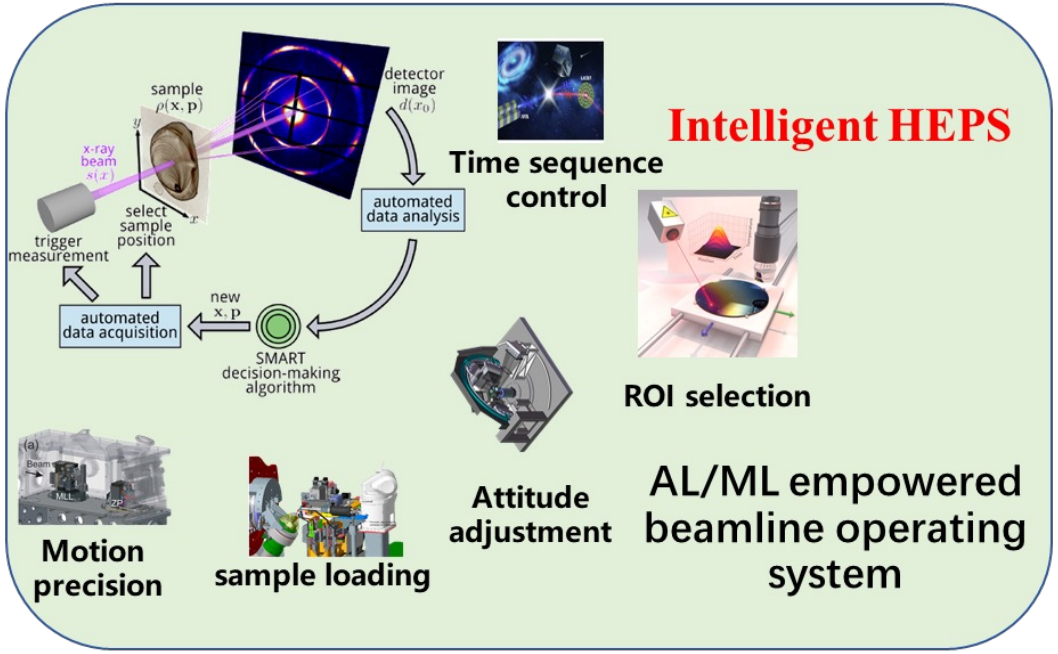


Contact： **heps.beamline@ihep.ac.cn**

Scientific software (control and data analysis)

Software framework design for next generation synchrotron source





- An ambitious and challenge project
- No legacy issue

Contact: zhangyi88@ihep.ac.cn

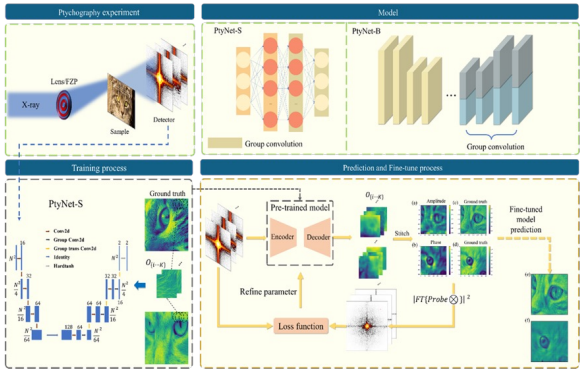
AI for synchrotron science

- **Open new opportunities in science**

Fully leverage **AI/ML and digital twin** capabilities to **extract information** from big data streams, **steer experiments**, **design experiments**, and use on-demand data for **ML-driven discovery**

Algorithm-driven methodology optimization

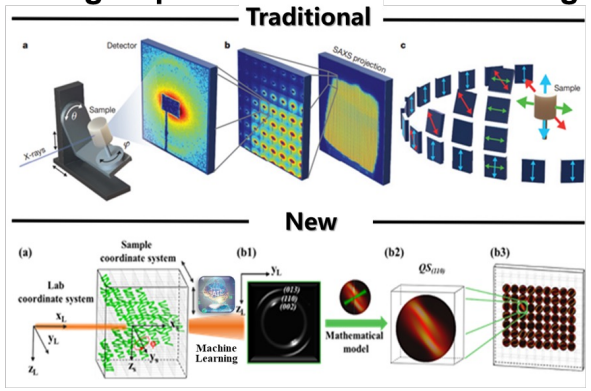
Efficient Ptychography Reconstruction Strategy Using Large Pre-trained Deep Learning Model



- Big Model training strategy enhances the phase reconstruction efficiency, high accuracy at very low overlapping rate;
- Speed up experiment acquisition significantly.

X.Y. P et al, *Cell Reports Physical Science*, second revision
X.Y. P et al, *Acta Physica Sinica*, 2023

Fast Extraction of Nanofiber Orientation from WAXD Patterns Using Supervised Machine Learning

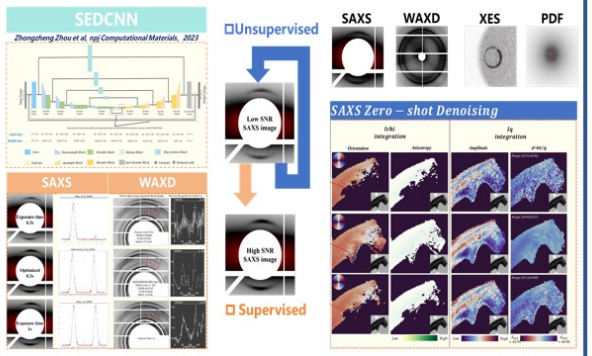


- Virtual reciprocal scanning approach for six-dimensional diffraction tensor tomography, without diffraction information loss
- Reduces acquisition time from days to within one hour

M. H. S et al, *IUCrJ*, 2023
X. Y. Zh et al, *IUCrJ*, Second Revision

Data-driven methodology optimization

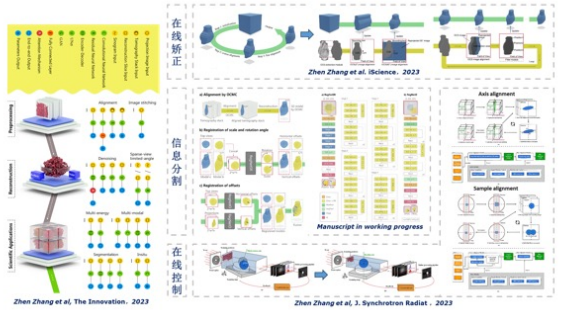
Physical Information-Embedded Unsupervised Denoising Using AI



- Minimum radiation dose, maximum information, systematic x-ray image denoise solutions for a wide range of techniques
- Achieved great performance boost under zero-shot mode

Zhongzheng Zhou et al, *npj Computational Materials*, 2023

Full-stack Synchrotron Tomography Data Processing Pipeline (STDPP)



- End-to-end AL/ML tools for a full-stack pipeline
- Dynamic correction under acquisition, push the time and spatial resolution

Z. Zhang et al, *The Innovation*, 2023
Z. Zhang et al, *iScience*, 2023

Contact: **zhangyi88@ihep.ac.cn**

Scientific software and computing at HEPS

Candidate requirements

- The successful candidate is expected to a PhD degree at physics, applied mathematics, computer science etc. and have *Knowledge and experience in*
- Software framework design
- Beamline automation
- Image processing
- Big data science
- Machine learning in synchrotron data analysis

Contact：
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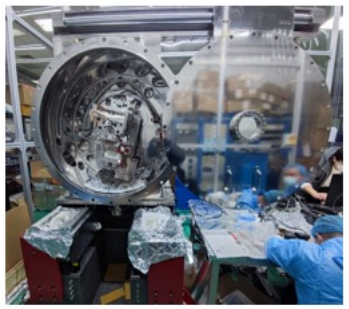
Optics and beamline engineering

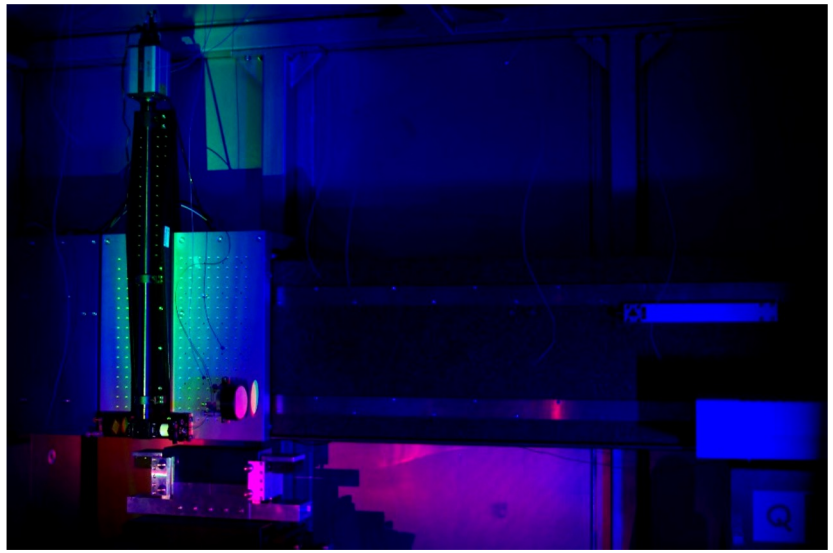
- X-ray optics
- Thermal management
- Optics metrology
- Wavefront preservation and crystal/device fabrication

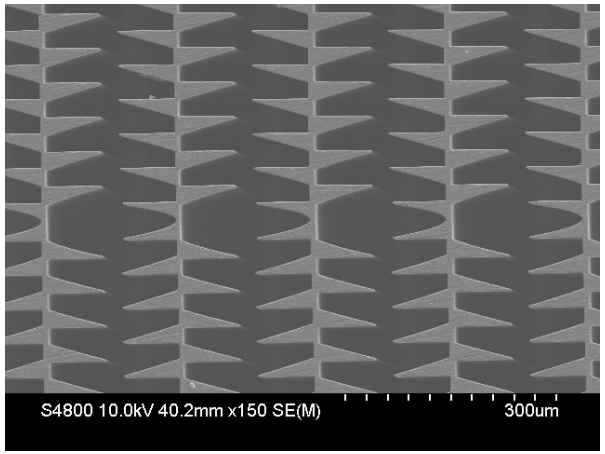

VDCM

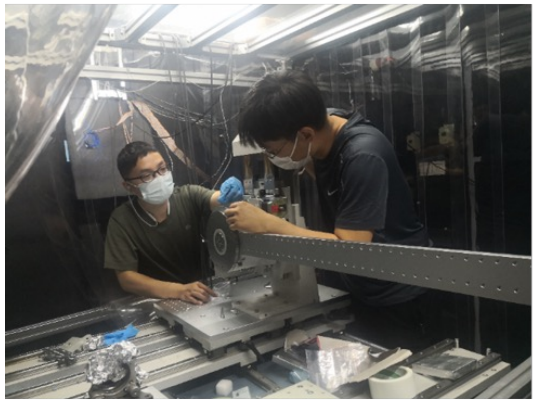

HDCM


Fast-scan DCM


HR-DCM



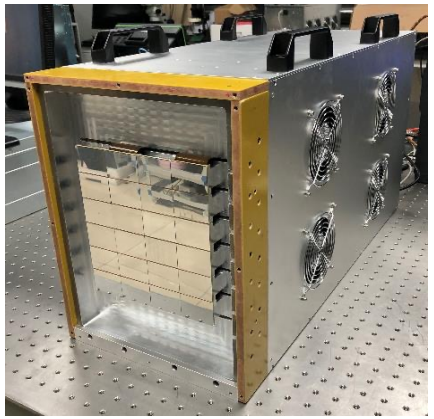
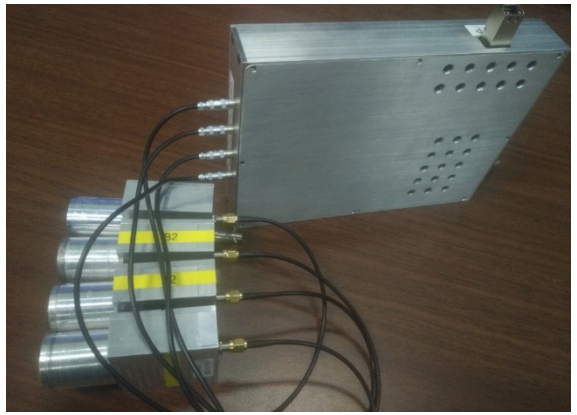
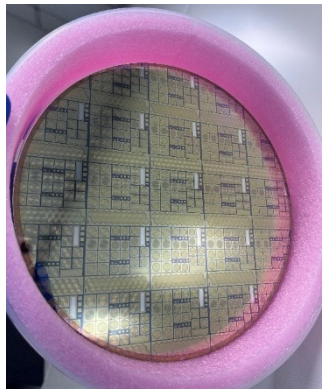




Contact：
lim@ihep.ac.cn

Detector developments at HEPS

◆ The HEPS detector group Contact： lizj@ihep.ac.cn

- We are developing the domestic detectors including the pixel array detector, the nanosecond time resolved detector, the diamond XBPM detector and silicon drift detector for the HEPS.

- We have built a professional detector research and development laboratory, including 500m^2 Clean room, Electronics Laboratory, Semiconductor Packaging Laboratory and Sensor research Laboratory.

Detector developments at HEPS

Contact： lizj@ihep.ac.cn

Candidate requirements

- The successful candidate is expected to play a leading role in the detector development for at least one of the following aspects:
- The IC design (integrated circuit design) --Ph.D degree required
- The system electronics design-- Ph.D degree required
- Data acquisition and processing of the detector
- The X-ray Sensor design and process development -- Ph.D degree required

Experiences with IC design , photosensor and readout system, or data acquisition are preferred.

03

Life and Work
In HEPS and Huairou Science City (HSC)

Where is HEPS?

Huairou Science City (HSC)

HSC, one of three national science centers in China
HEPS is the flagship facility at HSC

Space Environment Monitoring Network

Synergetic Extreme Condition User Facility

Multimodal Biomedical Imaging Facility

Earth System Science Numerical Simulator Facility

Where You Will Work

HSC

Huairou, the APEC meeting site, is a pleasant place to live and work

Scenic hiking trails along lakes and in mountains near the Great Wall

Skiing – Huaibei, the nearest ski resort, is within 10 km;

2022 Winter Olympics ski resort within three hours' driving distance

We welcome all applicants worldwide